Name:

at1117paper: Complete the Square (v315)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 56 feet. Their combined area, found by adding the square's area and the rectangle's area, is 2025 square feet. What is the value of x?

Example's Solution

$$x^2 + 56x = 2025$$

To complete the square, add $\left(\frac{56}{2}\right)^2 = 784$ to both sides.

$$x^2 + 56x + 784 = 2809$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 28)^2 = 2809$$

Undo the squaring.

$$x + 28 = \pm\sqrt{2809}$$

$$x + 28 = \pm 53$$

Subtract 28 from both sides.

$$x = -28 \pm 53$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 25$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 38 feet. The total area, of the square and rectangle, is 368 square feet. What is the value of x?

$$x^2 + 38x = 368$$

$$x^2 + 38x + 361 = 729$$

$$(x + 19)^2 = 729$$

$$x + 19 = \pm 27$$

$$x = 8$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 54 feet. The total area, of the square and rectangle, is 715 square feet. What is the value of x?

$$x^2 + 54x = 715$$
$$x^2 + 54x + 729 = 1444$$
$$(x + 27)^2 = 1444$$
$$x + 27 = \pm 38$$
$$x = 11$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 36 feet. The total area, of the square and rectangle, is 405 square feet. What is the value of x?

$$x^2 + 36x = 405$$
$$x^2 + 36x + 324 = 729$$
$$(x + 18)^2 = 729$$
$$x + 18 = \pm 27$$
$$x = 9$$